marconi instruments

PROGRAM STORE

TK 7298

autotest system 80

MP MASTER
MA23650

PROGRAM STORE

TK 7298

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1977

MARCONI INSTRUMENTS LIMITED
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Each page bears the date of the original issue or the code number and date of the latest amendment (Am. 1, Am. 2 etc.). New or amended material of technical importance introduced by the latest amendment is indicated by triangles positioned thus ▶ ... ◀ to show the extent of the change. When a chapter is reissued the triangles do not appear.

Any changes subsequent to the latest amendment state of the manual are included on inserted sheets coded C1, C2, etc.

NOTES AND CAUTIONS

SAFETY PRECAUTIONS

This equipment is protected in accordance with IEC Safety Class 1. It has been designed and tested according to IEC Publication 348, 'Safety Requirements for Electronic Measuring Apparatus', and has been supplied in a safe condition. The following precautions must be observed by the user to ensure safe operation and to retain the equipment in a safe condition.

Defects and abnormal stresses

Whenever it is likely that protection has been impaired, for example as a result of damage caused by severe conditions of transport or storage, the equipment shall be made inoperative and be secured against any unintended operation.

Removal of covers

Removal of the covers is likely to expose live parts although reasonable precautions have been taken in the design of the equipment to shield such parts. The equipment shall be disconnected from the supply before carrying out any adjustment, replacement or maintenance and repair during which the equipment shall be opened. If any adjustment, maintenance or repair under voltage is inevitable it shall only be carried out by a skilled person who is aware of the hazard involved.

Note that capacitors inside the equipment may still be charged when the equipment has been disconnected from the supply. Before carrying out any work inside the equipment, capacitors connected to high voltage points should be discharged; to discharge mains filter capacitors, if fitted, set the equipment supply switch to ON.

Mains plug

The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension lead without protective conductor. Any interruption of the protective conductor inside or outside the equipment is likely to make the equipment dangerous.

Fuses

Note that the supply fuse is connected in series with the brown (live) wire of the supply lead. If the equipment is connected to the supply via a two-pin plug, it will be possible for the fuse to become connected to the neutral side depending upon the orientation of the plug in its socket. In these circumstances certain parts of the instrument could remain at supply potential even after the fuse has ruptured.

To provide protection against breakdown of the supply lead, its connectors, and filter where fitted, an external supply fuse (e.g. fitted in the connecting plug) should be used in the live lead. The fuse should have a continuous rating not exceeding 6 A.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of mended fuses and the short-circuiting of fuse holders shall be avoided.

Chapter 1

GENERAL INFORMATION

CONTENTS

Para.
1 Introduction
5 Specification
9 Options

INTRODUCTION

1. Program Store TK 7298 has been designed to be inserted between a paper tape reader and an Auto test tape system's controlling device (e.g. the TK 7058 controller which is part of an OA 1444B executive controller). This allows test programs to be prepared on paper tape and then stored and accessed at high speed as required. Once the program is in store the tape reader is no longer necessary.

2. The program store is built around a Digital Equipment Corporation (DEC) LSI-11 micro-computer system. The input and output functions of the store being controlled by a micro-program permanently stored on a Read Only Memory board conntected to the LSI-11.

3. The store part of the processor is expandable from 4K (K = 1024 x 16 bit words) up to a maximum of 16 K in units of 4 K. The first 4 K is semi-conductor memory physically located on the processor module. Each extra 4 K is also semi-conductor but is located on separate modules.

4. All the above modules are contained within the TK 7298 casing as also is an optional serial Line Interface board for use with an external console device (e.g. teletype). If a console device is included in the system then a number of computer controlled functions become available, including editing of the program in store.

SPECIFICATION

5. Speeds

Read speed (from paper tape reader) : As fast as tape reader (for Tally R2000 this is approx. 200 chars./sec.)*

Write speed (to controller): As fast as controller can accept characters (for TK 7058 controller this is approx. 2000 chars./sec.)

Transfer rate (to controller from reader via store) : As for Read.*

* The read transfer rate is dependent on the executive software

6. Inputs and Outputs

All signals to or from the program store should be, or are, t.t.l. compatible. The TK 7298 was designed to work with an OA 1444B type controller and hence with the special machine code language developed for that device. This language is written in ASCII with even parity, hence the program store accepts data in 8-bit form and outputs it to the controller in the same format. The data in each program is a sequential list of tape code commands and with the exception of two, do not affect the TK 7298. The exceptions are :

which denotes the start of a tape and

* which denotes the end of a tape.

7. Dimensions

Height	3 7/16 in. (87.5 mm)	
Width	19 in. (483 mm)	[rack mounting]
Depth.	17 in. (432 mm)	

8. Power requirements

DC - The TK 7298 generates its own d.c. supplies

AC - The TK 7298 can be configured, by hard wired links, to operate from either a 230 V a.c. (nominal) or 115 V a.c. (nominal) 50 Hz ±1 Hz single phase supply; with all options fitted it requires approximately 210 W max.

OPTIONS

9. Two options are available for the TK 7298 :

1) TK 7315 4 K Store Increment.

Up to three TK 7315's can be added to the basic LSI-11 computer, thus expanding available store from 4 K up to 16 K in increments of 4 K.

2) TK 7316 Console Device Interface

One TK 7316 serial line interface board can be added to the basic LSI-11 computer to allow a console device (e.g. a teletype) to be included in the system.

10. To allow the presence or absence of the above options to be defined a suffix number is added to the program store number : i.e. TK 7298/xy,

Where x = 0 if no console device interface is fitted
= 1 if an interface is fitted
y = 1 for basic version (i.e. 4 K store)
= 2 for 8 K version (basic + 4 K)
= 3 for 12 K version (basic +8 K)
= 4 for 16 K version (basic + 12 K)

for example TK 7298/03 has no console device but has two TK 7315 boards giving a total of 12 K store.

Chapter 2

INSTALLATION

1. The TK 7298 Program Store is a rack mounting piece of equipment which will normally be supplied as part of an Autotest Tape Controlled system. As such no separate installation instructions are necessary since the installation and commissioning of the system is handled by Marconi Instruments Service Engineers.

2. If the instrument is to be returned for servicing attach a label indicating the service required, type or model number (on rear label), serial number and your return address. Use a strong double-wall carton packed with a 7 to 10 cm layer of shock absorbing material around all sides of the instrument to hold it firmly. Protect the front panel controls with a plywood or cardboard load spreader.

Chapter 3

OPERATING INSTRUCTIONS

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CONTROLS AND INDICATORS

Front Panel

1. Fig. 1 illustrates the front panel of the program store while the following text describes the purpose of the indicators and controls.

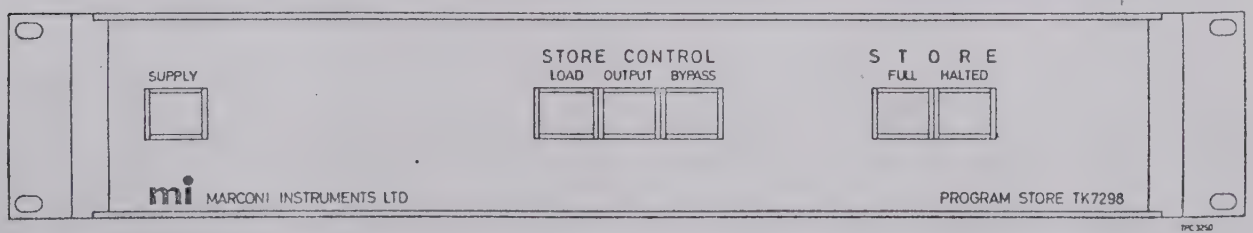

Fig. 1 TK 7298 Front panel.

(1) SUPPLY, Red latching push-button switch with lamp.
When depressed and the lamp lit, mains power is available to the unit.

(2) STORE CONTROL, Three interlocked momentary action push-button switches with lamps. When one is ON its lamp is lit and the other two switches and lamps are off.

a) LOAD, white. When pressed data from the paper tape reader is loaded into the store.

b) OUTPUT, green. When pressed data from the store is transferred to the controller.

c) BY-PASS, yellow. When pressed the program store is isolated from the system and data is transferred directly from the paper tape reader to the controller.

(3) STORE, two red lamps.

a) FULL. Lit when data reaches the top of the available store (i.e. there is no more room). The full information is passed to the controller which would normally halt the paper tape reader.

b) HALTED. Lit when the circuit is not receiving SYNC pulses from the micro computer and data cannot be strobed into or from the input/output registers, i.e., if fault condition exists or if data is being typed in from the console device (if fitted).

Rear Panel

2. Chap. 5, Fig. 2 illustrates the rear panel of the TK 7298. The following text details the controls shown. Note that connections to and from the program store are made directly from the printed circuit board edge connectors and only the cables appear at the back panel. Table 1 gives the connections and signals on the edge connectors and also includes this information for connections to a Tally R2000 paper tape reader and for a TK 7058A Controller (part of an OA 1444B.).

3. Other connections on the rear panel are the a.c. mains power receptacle with associated fuse, and the earth terminals TP1 and TP2. TP1 is connected directly to the chassis of the instrument. TP2 is the 0 V line from the 5 V and 12 V d.c. power supplies. When working in a system with other autotest equipment TP2 is connected to similar terminals on that equipment and to a system earth. When used in isolation TP1 and TP2 should be linked.

OPERATION OF A PROGRAM STORE WITH AN OA 1444B TYPE CONTROLLER

4. The TK 7298 Program Store has been developed for use with OA 1444B systems which include a TK 7058A control unit. The following text gives operating procedures for use in such a system.

TABLE 1 TK 7298 INPUT/OUTPUT CONNECTIONS

TK 7298 Connection	Signal			Device Connection
	Dirn.	Effective form	Name	
a) To Paper Tape Reader				Tally R2000
PLD pin 1	←	x	Data bit 0	Pin A
2	←	x	Data bit 1	B
3	←	x	Data bit 2	C
5	←	x	Data bit 3	E
6	←	x	Data bit 7	F
7	←	x	Data bit 6	H
8	←	x	Data bit 5	J
9	←	x	Data bit 4	K
10	←	⌐	STROBE	L
A	→		0 V	1
B	←		5 V	2
D	→	x	L/R	4
H	→	⌐⌙	START	7
J	←	1	READY	8
L	←	1	EOT	10
b) To Controller				TK 7058A
PLC pin 4	←	x	L/R	PLBD Pin S
7	←	1	START	H
A	→	x	Data bit 0	d
B	→	x	Data bit 1	c
C	→	x	Data bit 2	T
E	→	x	Data bit 3	N
F	→	x	Data bit 7	U
H	→	x	Data bit 6	L
J	→	x	Data bit 5	R
K	→	x	Data bit 4	P
L	→	⌐⌙	STROBE	X

Program Tapes

5. Program tapes must be prepared in ASCII code with even parity and blank leader and trailer. The characters DEL (377) and NUL (00_8) are ignored in all positions. The first character on the tape must be ## (243_8) and all separate programs on the tape must start with $ (044_8). The last character on the tape must be * (252_8). Thus the generalised format is :-

BLANK ## $ (CRLF)(PROGRAM 1) $ (PROGRAM 2) $.... $ (PROGRAM N) (CR LF)* BLANK

6. The data in each program is a sequential list of tape code commands and need not be formatted. It is convenient for documentation and essential for in store editing that the text is broken up into convenient lines separated by CR, LF (215_8, 012_8), using the Test number codes (Z3xxxx) to enumerate the lines or tests. End of tape* should be separated from the last program by CR, LF since lines containing * cannot be edited.

Loading the Store

7. Initially after mains supply switch on

1. Place the tape in the reader with the blank leader under the read head.
2. Depress the LOAD button on the store.
3. Ensure that the controller is in FWD and Tape Reader CONTINUOUS. Digitize OFF and Manual Input OFF and on-line Teletype is not interrupting.
4. Press START. The tape will be read into store up to the * (end of tape). If this character has been omitted then the tape reader has to be manually halted with the STOP button. If the tape is too long for the store the load will be terminated with the STORE FULL lamp on, and the text pointer at the start of store. The part of the program resident in store may still be used in this condition.

8. To replace an existing program in store

1. Use the normal controller buttons to reach the start of program, e.g., select store OUTPUT, reader REVERSE and CONTINUOUS auto rewind OFF and press START.
2. When the TAPE STOPPED lamp is lit proceed as for initial loading described above.

9. To add a second tape immediately after the first

When the first tape stops at the * character, place the second tape in the reader with the blank leader under the read head and press FORWARD and then START. As many program tapes as desired may be loaded at this time until the store is full. In store the programs will be separated by * and # characters and when in store OUTPUT mode special operational sequences are necessary to move from one program to the next (see Para. 12).

10. To add a second tape to a program in use in store

1. The store text pointer must be set to the end of the existing program e.g. by test No. searching in FORWARD for non-existant Test No. with auto-rewind OFF.
2. Place new tape in reader and proceed as in initial loading.

Bypass Mode

11. In Bypass mode (i.e. when BYPASS is depressed) the Controller reacts in a standard way for all controls, apparently ignoring the Store's presence.

Output Mode

12. At the end of a load process the text pointer remains at the end of the last loaded tape and therefore to begin using a particular program in store, the start of program symbol must be searched for. This may be achieved using any of the following operations :-

a. Find Start of Current Program.

Auto-rewind ON; Reader CONTINUOUS, REVERSE; START.

b. Find End of Current Program.
Reader SEARCH TEST NO; FORWARD; Auto-rewind ON; TEST NO. Non-existant; START.

c. Skip to next program with no intervening * or # characters.
As (a) or (b) but press START a second time after re-asserting direction.

d. Skip over * to next tape in forward direction.
Find End of Current Program as above but with auto-rewind OFF
Re-assert FWD and reset auto-rewind if next program is the required one and START.

e) Skip over # to next tape in reverse direction.
Find start of current program as above but with rewind OFF
Re-assert REVERSE and reset auto rewind ON if next program is the one required. START.

13. When once the appropriate start of program has been found, all controller functions can be operated normally to use that program.

Stored program editing (only available with console device option)

Teletype Functions

14. At any time when the controller has stopped e.g. at the end of a search, or a test etc., the operator may interrupt from the console device keyboard using the BREAK key, and the text pointer will remain unchanged. When in interrupt mode using a teletype the functions listed in Table 2 are available.

15. If BREAK is typed during EDIT, SAVE, LIST or NEXT the command will cause the Teletype to interrupt the store. To proceed with the Command that was interrupted type P; to return to the executive type 0G.

Automatic Check response

16. After interruption and at the termination of all keyboard commands the store executive prints on the teletype a check pattern consisting of CR, LF.
OCTAL Address of exit of executive routine CR, LF
@ and is then ready for a new command.

TABLE 2 TELETYPE EDITING FUNCTIONS

FUNCTION	COMMAND	DESCRIPTION
LIST	173526G	Prints the current line of program, moving the text pointer to the beginning of it.
NEXT	173510G	Prints the following line of program, moving the text pointer to the beginning of it.
EDIT	173574G	Deletes the current line and allows the operator to substitute new text of any length (up to full store) terminated by the ESC key (or CONTROL SHIFT K). Text pointer is left at the start of insertion.
	CAUTION	Any programs after the * end of tape symbol are lost during editing i.e. any program to be edited must reside alone or be loaded last. Only in one special case can a line containing * be edited (see para. 17).
SAVE	173550G	Prints 192 null characters (during which the operator switches on the teletype punch) followed by a listing from the current line to the end of tape and followed by a further 192 blank characters, for trailer tape (during which the punch may be switched off). Leaves text pointer at * end of tape.
RETURN	P	Returns to controller with text pointer as left by previous command.
RESET	0G	Returns to controller with text pointer at beginning of store.
EXAMINE	R1/	Examines the value of text pointer and allows its change, by typing in a new setting in OCTAL terminated by CR.
	CAUTION	This function should be used with care, and only normally used to access a previous line by subtracting 1 after a LIST command and repeating LIST.
MANUAL I/P	173742G	Accepts 1 line terminated by CR, LF of tape codes for direct action by the controller. Text pointer and text in store unaffected.

Editing to join 2 tapes in store

17. Search to and list last line of program on penultimate tape. Command a list of the NEXT line - which will normally be CR, LF , *
EDIT that line substituting $ and any other data in the following program before its first line feed.

Error Exits

18. The following error conditions should be noted.

1. Store full in LOAD
   Tape stops, controller waits for button commands in REVERSE with Text pointer at start of store.
2. Store full in EDIT
   Input is terminated with last character typed lost and not echoed. Edit is terminated normally, the executive assuming an ESC
3. List NEXT line when none present.
   Store outputs * and exits with text pointer at *

Chapter 4

TECHNICAL DESCRIPTION

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INTRODUCTION

General

1. The TK 7298 Program Store utilizes a DEC LSI-11 micro computer configured as follows :

1	KD11-F	processor with 4K semi-conductor memory
1	H 9270	back plane unit
1	MRV11-AA	ROM card containing four 256 x 4 bit pre-programmed PROMS.

The following options can be added to this micro computer

1 to 3	MSV-11B 4K x 16-bit RAM word stores (TK 7315)
1	DLV-11 Serial line interface for teletype or v.d.u. (TK 7316)

2. The micro computer interfaces to the system via an R2000 Interface Board (44827-871H) which provides connections to a paper tape reader and to a TK 7058 (type) Control Unit. A power fail board (44828-064Z) is provided to monitor the d.c. power and provide the processor with failure warning.

3. These units are contained, with a power supply, within a box assembly. Connector outlets and controls and indicators are mounted on this assembly. Circuit details for the power supply and controls are given on SY 57298-900B. Fig. 1 is a block diagram of the TK 7298.

Microcomputer

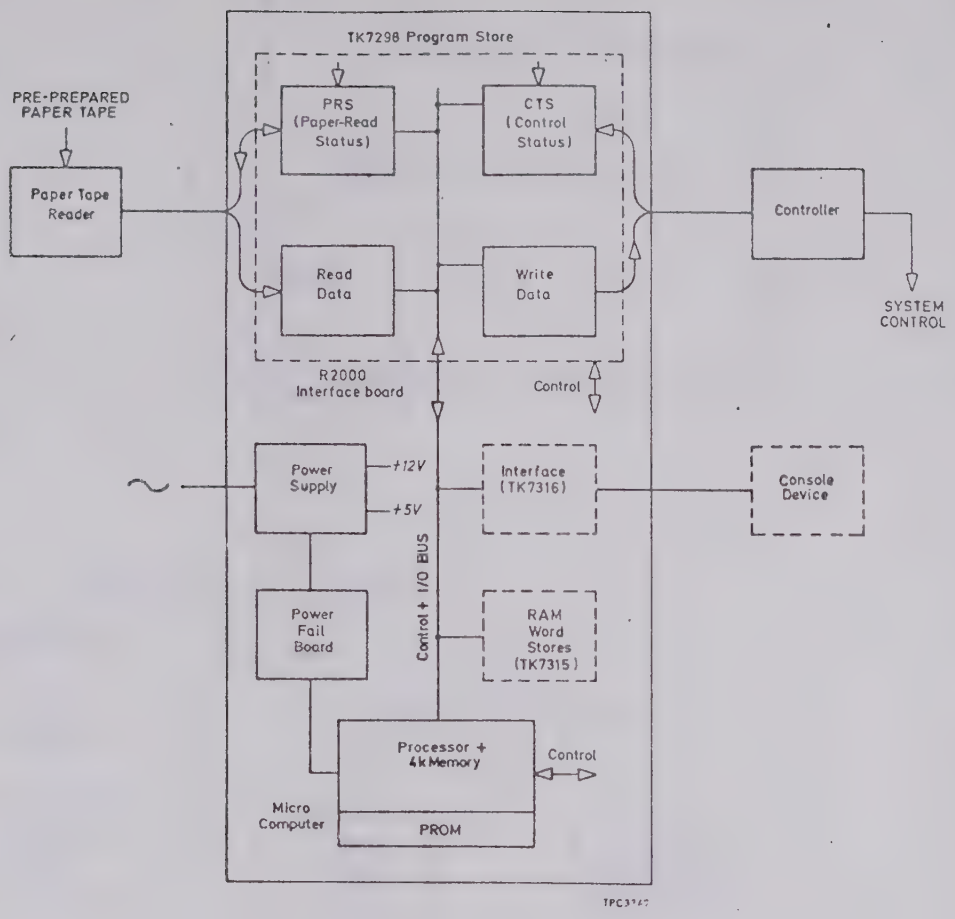
4. The central processor exerts executive control over data transfers into, from or through, the program store by means of a micro program held on the ROM card. Fig. 2 is a flow chart illustrating the principle of the transfer mechanism controlled by the micro program.

5. Details of the hardware for the micro computer can be found in the LSI-11 users manual. No attempt has been made to plagiarize that manual which must be referred to for processor information. Familiarity with the users manual is assumed in the rest of this TK 7298 technical description.

R2000 INTERFACE BOARD (44827-871H)

General

6. The circuit diagram for the R2000 Interface Board is contained in Chapter 7 (SZ44827-871H). Fig. 3 gives data on some of the more complex logic elements used on the board. Fig. 4 is a simplified version of the circuit, intended to show the principle of operation only.



Status Words

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PRS	Error (EOT or 5V	-	-	-	-	-	-	-	READY	0V	Size X	X	-	-	L/R*	START*
CTS	L/R	START	-	-	-	-	-	To/from Y	Y	-	-	-	-	-	-	-

Note ...

XX = Memory size, PRS bit : 5,4

4K (basic)	0 0
8K (basic + 1 RAM)	0 1
12 K (basic + 2 RAM)	1 0
16 K (basic + 3 RAM)	1 1

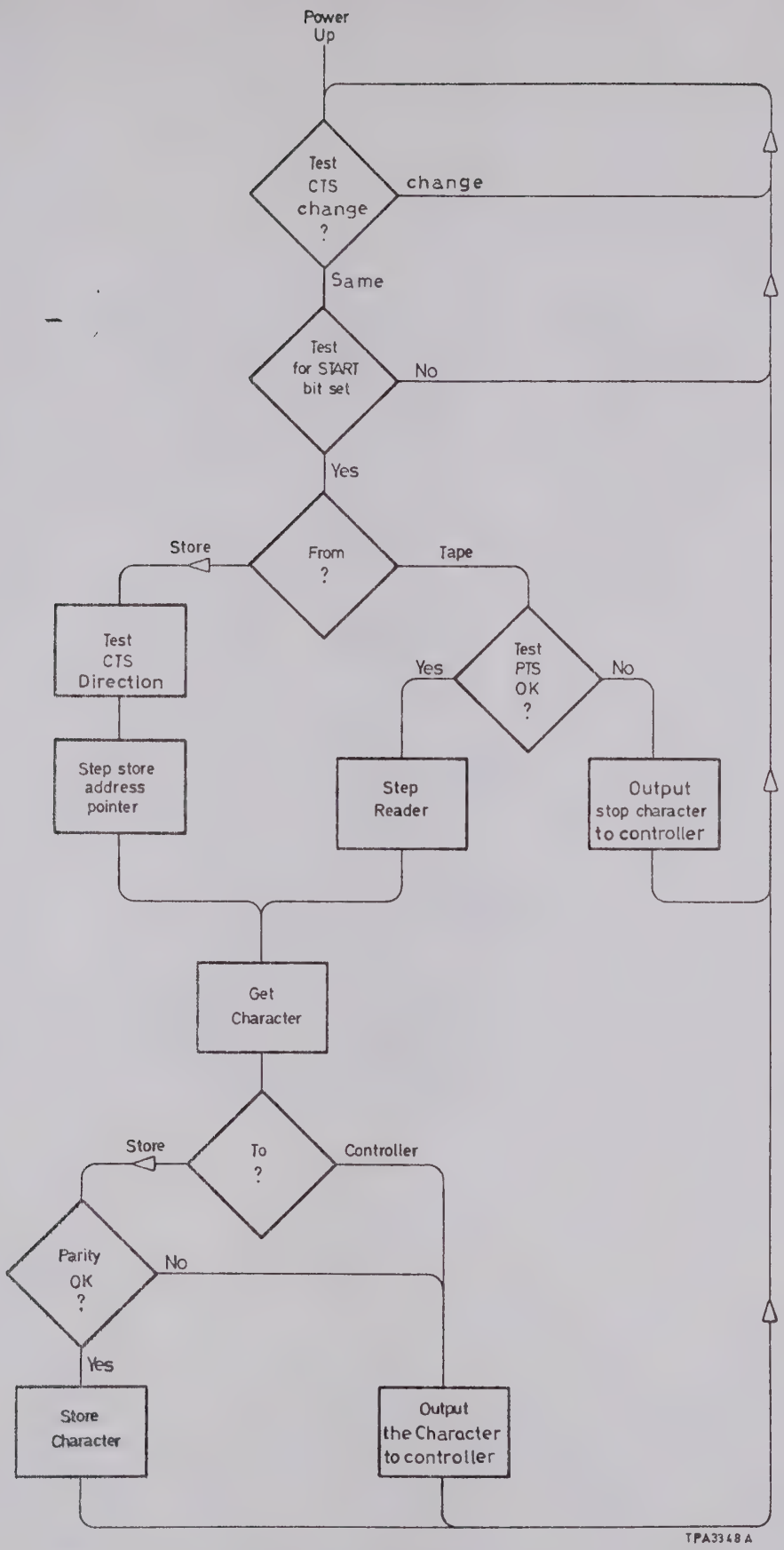
} Not used

YY = To/from, CTS bit: 8,7

OUTPUT (to controller)	0 1
LOAD (from PTR)	1 0
BYPASS (or reset state)	1 1

* PRS bits 1 and 0 are write only (to the Reader) all other bits are read only.

Fig. 1 Block diagram TK 7298.



NOTE : Transfers from store to store are not allowed

Fig. 2 Transfer principle flow chart.

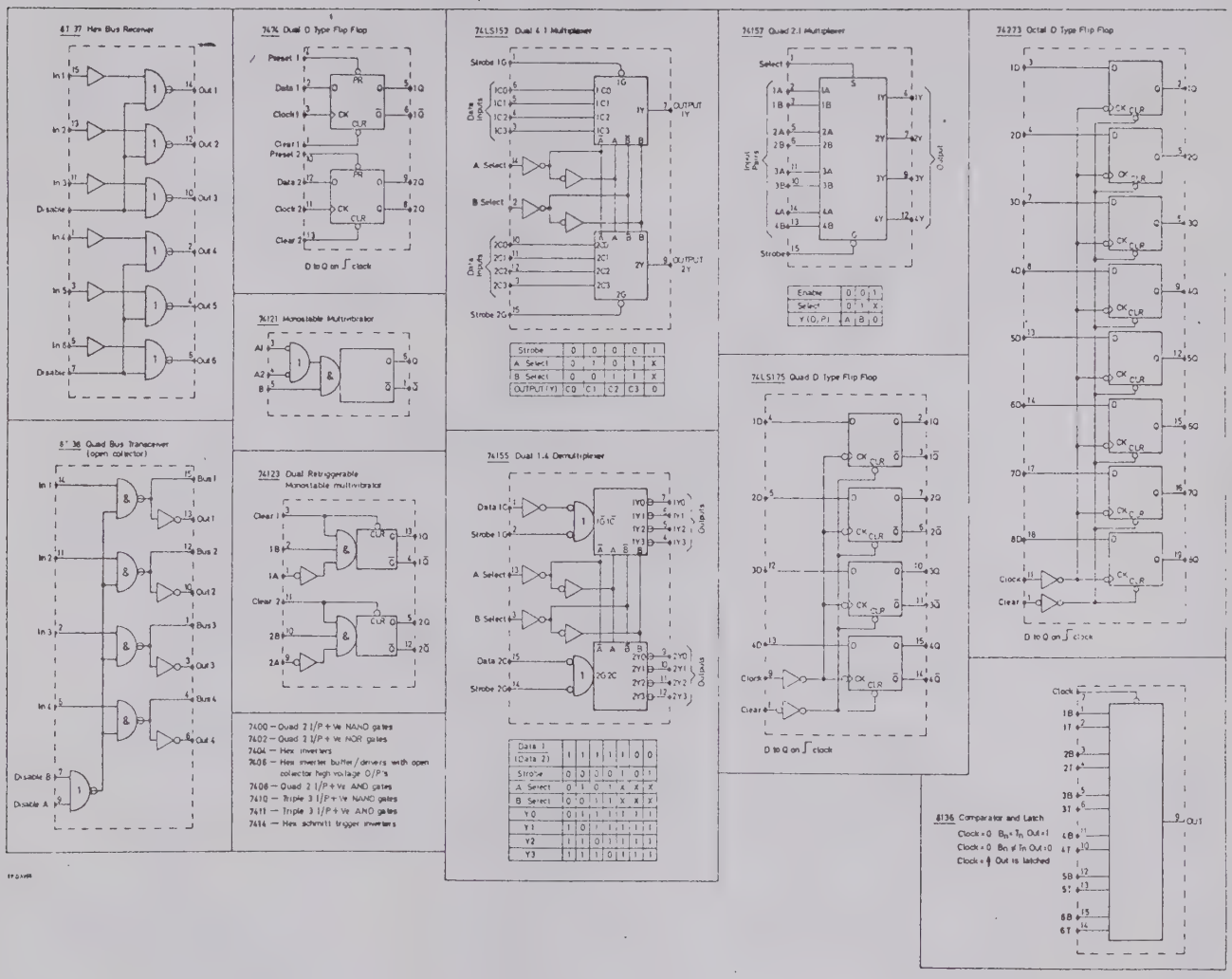


Fig. 3 TK 7298 Logic elements.

NOTE : This diagram is intended to convey functional logic flow information only. The circuit diagram must be consulted for actual details of the logic and logic levels.

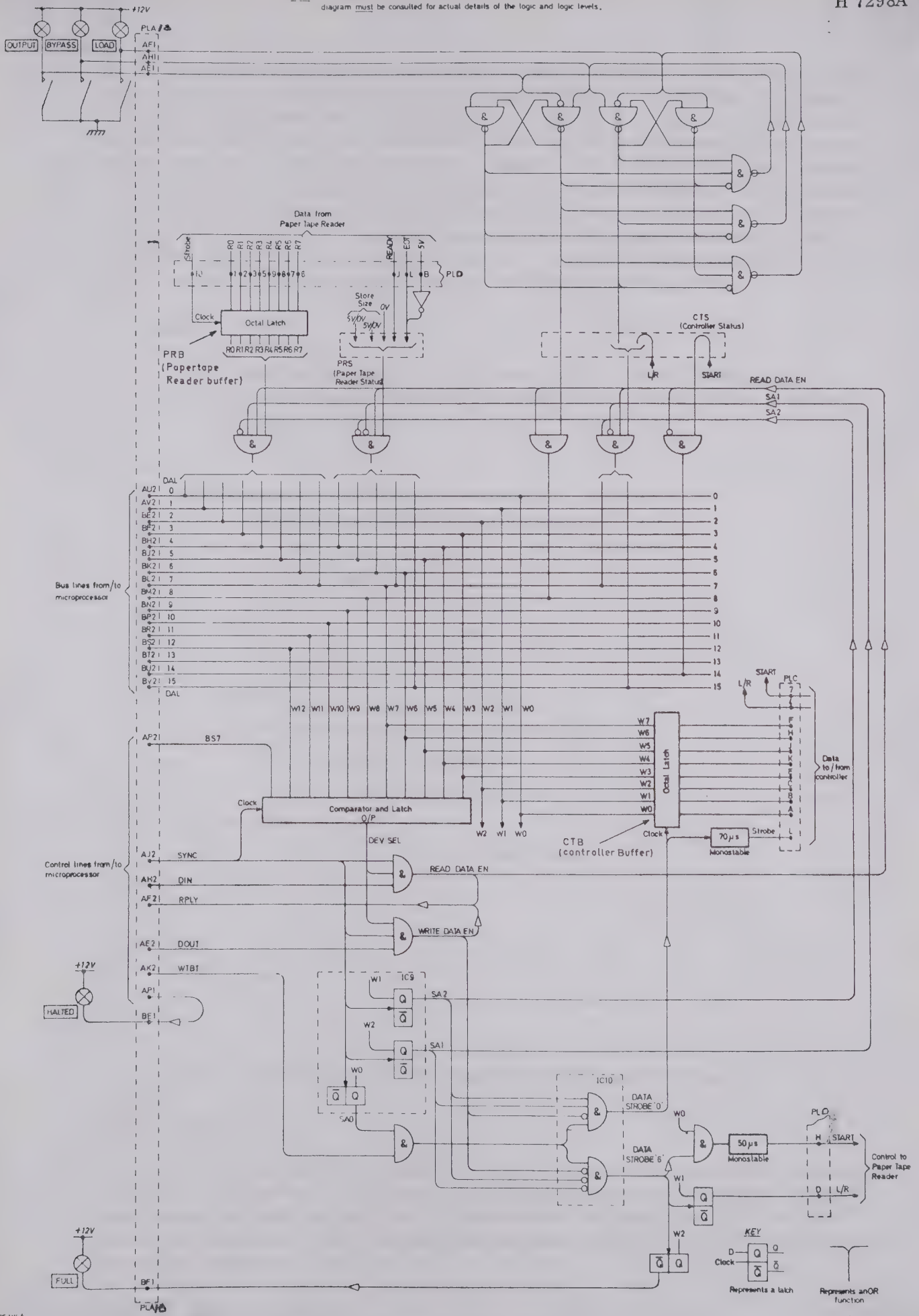


Fig. 4 Simplified diagram of R2000 interface board.

7. The R2000 Interface board has been designed to comply with the recommendations given in the LSI-11's Users manual which includes an illustration of a typical Programmed I/O Interface. This interface is used in the TK 7298 and reference to SZ 44827-871H shows that although the 8T38 type of logic element is used instead of the DEC 8641, IC's 1-10 correspond to those shown in the DEC manual illustration, with IC's 11, 23, 24 and 26 providing similar gate functions. The text associated with this illustration provides an adequate description of the transfer mechanism in terms of the I/O bus. The remainder of this description is intended to describe the functioning of the board in general terms. Fig. 5 is a summary of the timing characteristics of the I/O bus referred to the R2000 Interface Board.

Note ...

In the following description the term write is used to denote transfers from the computer store and the term read is used to denote transfers to the computer store.

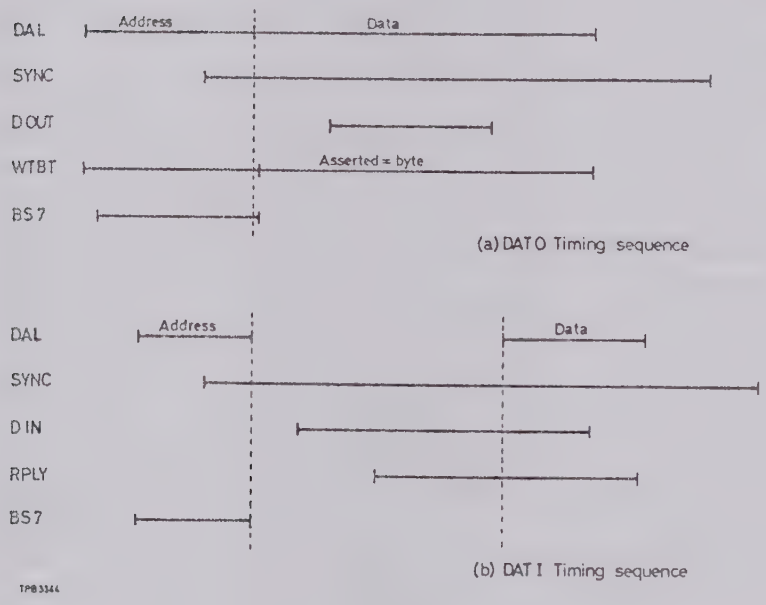


Fig. 5 Summary of I/O bus timing at R2000 Interface Board.

Data Transfers

8. Before a data transfer in either direction the R2000 Interface board is addressed by the micro processor. The leading edge of SYNC is used to latch bits 3-12 into a comparator and latch unit (IC7 and 8), and bits 0-2 into quad latch IC9. As SYNC remains asserted until after the data transfer these latched settings will not be changed during the transfer.

9. Bits 3 to 12 are compared with a pre-configured address and if satisfactory then DEV SEL is set (output of comparator and latch) thus priming the READ/WRITE ENABLE gates (IC26) and returning RPLY.

10. Bits 0 to 2 determine what type of data transfer is to take place, and the outputs of the quad latch IC9 (termed SA0, SA1 and SA2) are used to enable the required logic. The decode situation is summarized in Table 1. Note that SA0 corresponds to Address bit W0, etc.

TABLE 1 Bus Transfer Code

Function	Data Direction		Address decode		Data word decode			Effect
	DOUT	DIN	SA1	SA2	W0	W1	W2	
Data Output	⌐	0	1	1	X	X	X	a) Clocks data into octal latch IC19 ready for controller to read off. b) Fires monostable IC13 to produce (+)ve going strobe pulse to controller.
Commands	⌐	0	0	0	1	X	X	Fires monostable IC14 to produce (-)ve going START pulse to reader.
	⌐	0	0	0	X	1	X	Clocks dual latch IC20 and commands reader to forward read.
	⌐	0	0	0	X	0	X	Clocks dual latch IC20 and commands reader to reverse read.
	⌐	0	0	0	X	X	1	Clocks dual latch IC20 and lights STORE FULL.
Data Input	0	1	1	0	X	X	X	Data from reader, latched in IC18, transferred to store.
Status	0	1	0	1	X	X	X	Control status (CTS) transferred to sto
	0	1	0	0	X	X	X	Paper Tape Reader Status (PRS) transferred to store.

Write functions

11. As only byte transfers are considered no byte pointer is required and SA0 will always be 0. Thus when WTBT is set the Data 1 input of IC10 is set to 0. On write functions SA1 and SA2 are both 0 or both 1, these applied to the Select inputs of IC10 point either to IC20 (DATA STROBE '0') for tape reader control commands or to IC19 (DATA STROBE '6') for passing data to the controller.

12. If now DOUT is asserted (i.e. data is on the I/Obus) the strobe input to IC10 is enabled and the selected output of IC10 goes to 0. If it is DATA STROBE '0' then monostable IC14 is fired to create a 50 μs negative-going START pulse to step the reader and provide the next character. Removing DOUT returns DATA STROBE '0'

to 1 providing a positive-going edge to clock dual latch IC20.

13. One output of this latch is provided by W1 and informs the paper tape reader in which direction the next character to be read in is located. Note that the START pulse steps the character in the direction determined by a previous write operation. The second output is controlled by W2 and if set it is inverted, effectively grounding one side of the STORE FULL lamp, on the front panel, causing it to light.

14. If the selected output from IC10 is DATA STROBE '6' then the positive-going edge of DOUT latches the data character into IC19 ready for the controller to read it off.

Read functions

15. SA1 and SA2 are applied to the select and strobe inputs of the 74157 2:1 Multiplexers IC15 and IC16 and to both select inputs of the 74LS153 4:1 Multiplexer IC17. When DIN is asserted the selected multiplexer inputs are routed to the I/O bus. Table 1 shows the combinations of SA1 and SA2 which route data, paper tape status, or controller status to the processor. Note that two status bits are not controlled by SA1 or SA2; bit 8 (which indicates whether data is being input to the TK 7298) and bit 14 (START) always convey the same meaning whether data or status are being transferred.

16. Data. A complete 8-bit character output from the paper tape reader is clocked into 74273 octal latch IC18 by a strobe signal from the paper tape reader. This character can then be read in by the processor when it is ready. Having read in the character the processor sends a stepping pulse (START) to the reader and the next character is transferred to IC18.

17. PRS. The bit settings of the Paper Reader Status Word are derived as follows :

a) Bits 4 and 5. These bits represent the size of memory fitted, as shown in Fig. 1. The settings are determined by hard wired links from R27 and R30 to 0 V. This facility is not used in current systems.

b) Bit 6. This bit is always 0 but is effectively a spare.

c) Bit 7,READY. The Ready signal from the paper tape reader is routed via IC17 with no intervening logic.

1 = Ready for transfer, 0 = Not ready

d) Bit 15, Error. Two error conditions exist : Either the paper tape reader has run out of tape to read (e.g. the tape has broken) or the reader's 5 V power line has failed. In either case the reader cannot transfer further information and bit 15 of the PTS remains set whilst the fault exists.

18. CTS. The bit settings of the controller status word are derived as follows :

a) Bit 7 and 8. These two bits reflect the setting of the front panel LOAD, OUTPUT and BYPASS switches as shown in Fig. 1. For example if LOAD is pressed, 0 V appears on PLA pin F1. This sets the following

bistable (3rd. gate of IC24, 1st. gate of IC22) and bit 7 of CTS is set to 0. Setting the bistable also enables a 'feedback' gate (2nd. gate of IC21) which holds the LOAD input at 0 even when the switch is released. Further gating ensures that this condition is unique and that BYPASS and OUTPUT are not set at the same time. If one of these switches is pressed then the LOAD condition is removed and the new selection fixed in a similar manner.

b) Bit 14, START. The START line from the controller is wired directly to the I/O bus element IC5 with no intervening logic. This line indicates that the controller is ready to accept information and that the micro processor should initiate transfer procedures.

1 = Start 0 = Stop

c) Bit 15, L/R. This bit indicates in which direction the controller wishes the paper tape reader to operate. The information is routed via IC17 with no intervening logic.

1 = Reverse 0 = Forward

POWER FAIL BOARD (44828-064Z)

DCOK line

19. The DCOK line is derived from the output of transistor array IC1 connected as a current mirror and amplifier driving Schmitt trigger IC4b. The power rail for the amplifier is derived from emitter follower TR1 which has a base voltage of approx. 6.2 V controlled by Zener D2. The base emitter junction of TR1 and the forward impedance of D3 drop this voltage to approximately 5 V before its use as a power rail.

20. The input to the current mirror IC1 is derived from the 12 V supply via R2 as shown in Fig. 6. Zener D4 and R21 clamp D5 cathode to approximately 5 V. R6 is adjusted so that the current flowing through it is slightly less than the current into the current mirror via R2 and R4. If now either of the 12 V or 5 V rails fall sufficiently to forward bias D5 or D1 respectively, then the current for IC1 is diverted through that diode and DCOK falls.

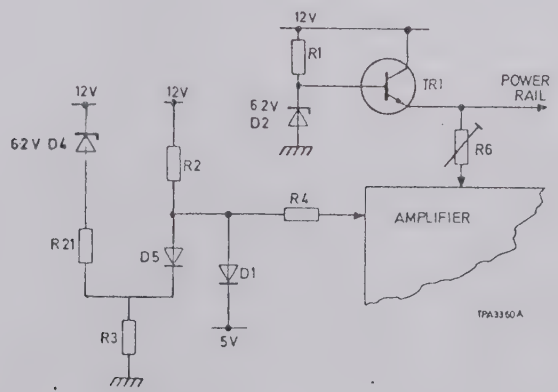


Fig. 6 DC supply monitor circuit.

21. Deleted.

POK line

22. The POK line is driven by a retriggerable monostable IC3, via Schmitt trigger IC4a. The retriggering pulses are obtained from the transformer secondary connected, via two diodes D6/D7 to give a 100 Hz waveform, to a transistor array IC2 connected as an amplifier.

23. The power rail for the amplifier and IC3 is the same as used for the DCOK circuit and, since there is only one secondary on the transformer, R14 can be adjusted to determine the switching point of the transistors in the amplifier. If the a.c. power is satisfactory IC3 is continuously retriggered to provide a constant POK output. Note that DCOK is connected to the clear input of the multivibrator and if DCOK goes down then POK is forced down immediately.

POWER SUPPLY

24. The Program Store Power Supply and Wiring Diagram (SY 57298-900B) in Chapter 7, contains the circuit of the power supply. The power supply is of a conventional type using a bridge rectifier D1 to convert the output of the single transformer secondary. The output from D1 is used in two ways :

a) By a 12 V regulator, IC2 to produce the stabilized 12 V rail.

b) By a switched Mode Regulator, IC1 to produce a 5V, 6 A output. Use of the SMR allows the whole power supply to be kept compact. Capacitors C3 and C4 are used to suppress noise appearing at the input while Zener D4 limits the output.

25. Each d.c. supply is fused, as is the live side of the a.c. input. Note that while the SUPPLY switch controls the a.c. power the associated lamp is across the 12 V d.c. supply. The cooling fans are connected across the transformer primary.

Chapter 5

MAINTENANCE

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GENERAL

1. No attempt has been made in this chapter to provide routine maintenance information or adjustment details neither of which are necessary. The data above lists the included information which, in conjunction with Chapters 4 and 7 should provide enough data to repair the instrument, if necessary.

Note ...

For information on the DEC equipment fitted in the TK 7298 reference must be made to the relevant diagrams supplied by DEC.

ACCESS

2. Access to the TK 7298 is achieved by removing the instrument from the rack and removing the top cover - held by six screws. The constituent parts of the instrument can then be located by reference to Figs. 1 and 2. The H 9270 backplane assembly has been designed to hinge upwards to provide access to its boards.

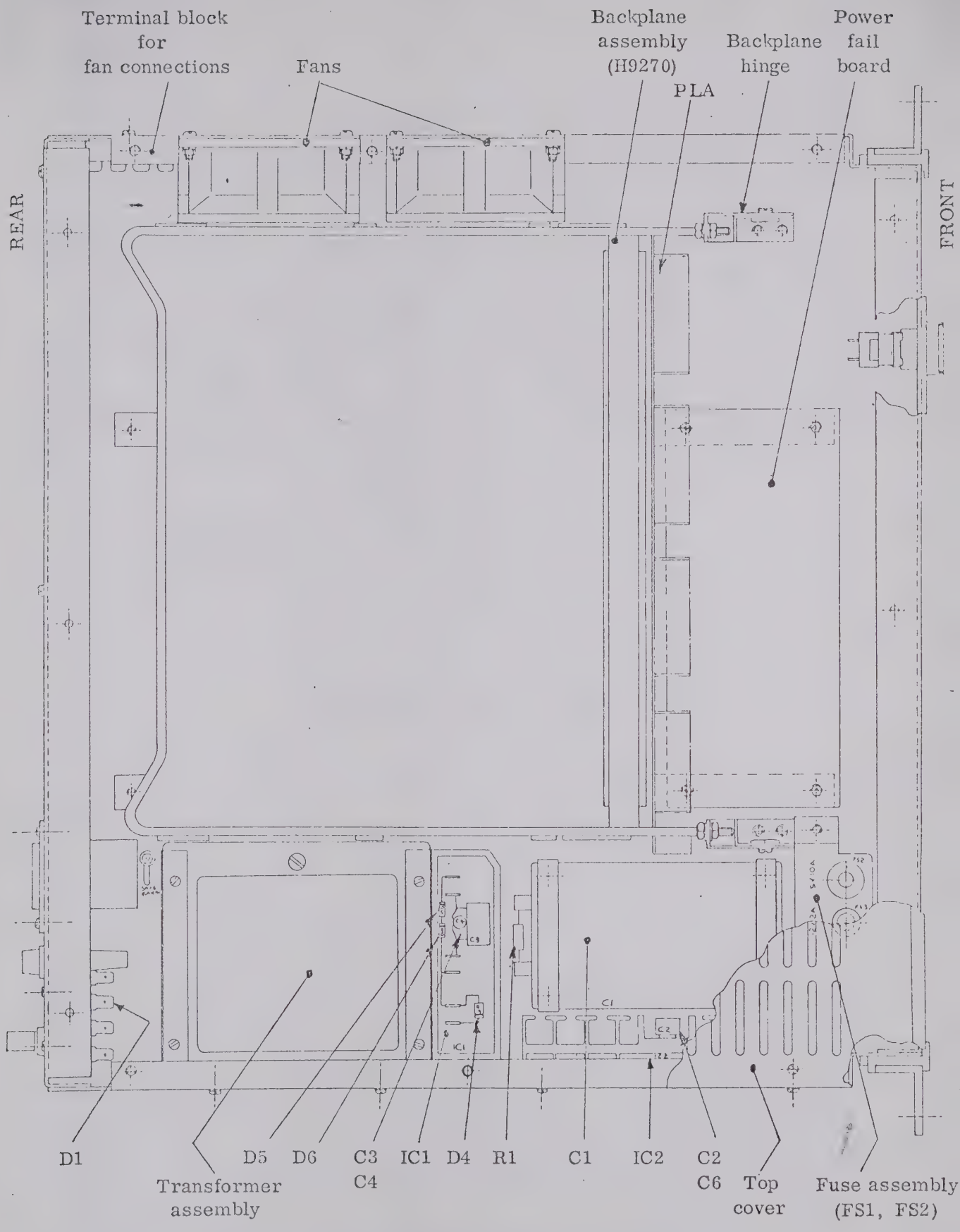

Fig. 1 Layout of TK 7298.

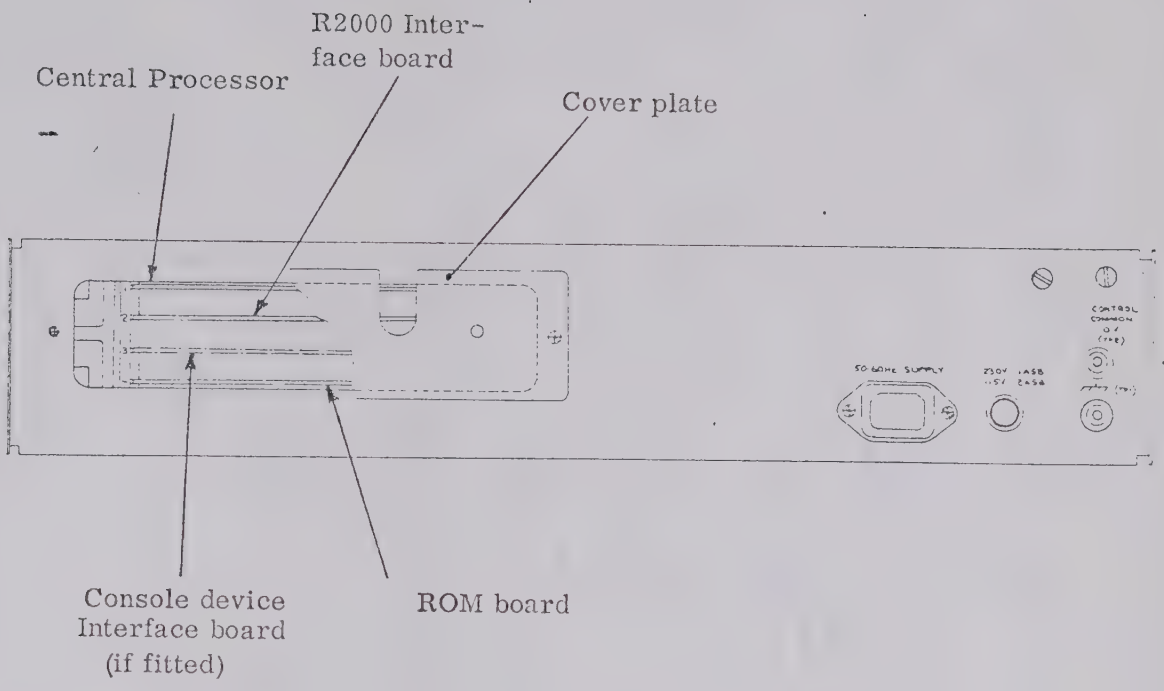

Fig. 2 Rear view of TK 7298

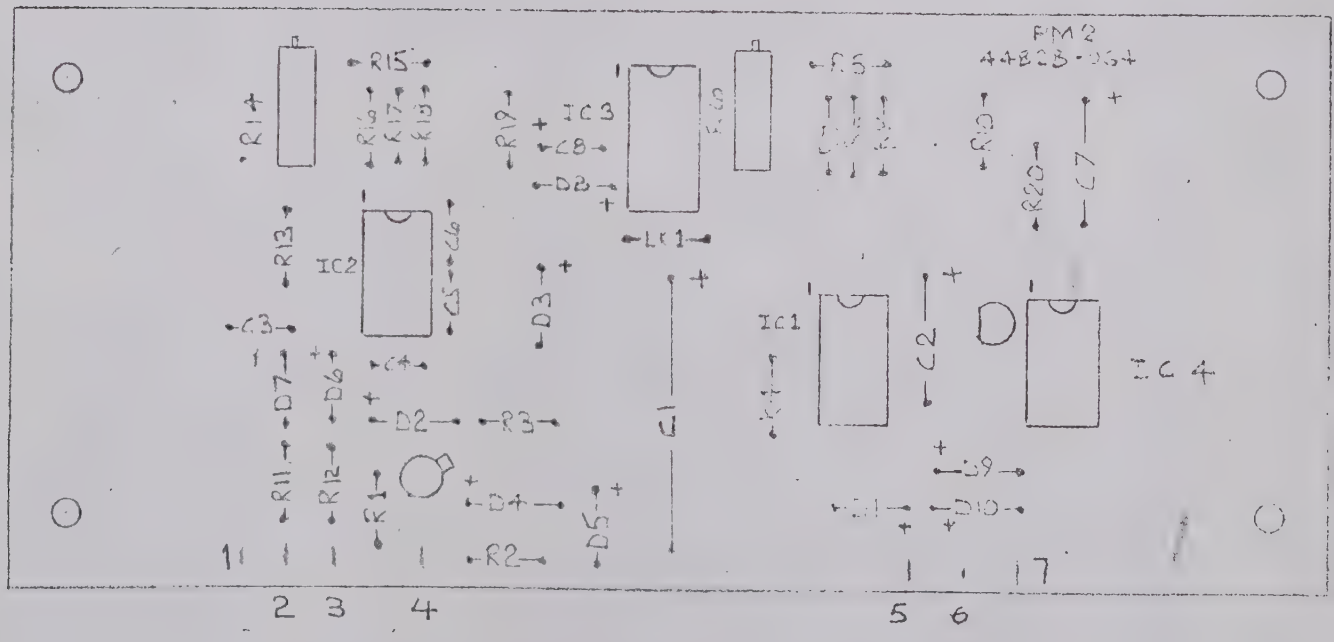

Fig. 3 Layout of power fail board (44828-064Z)

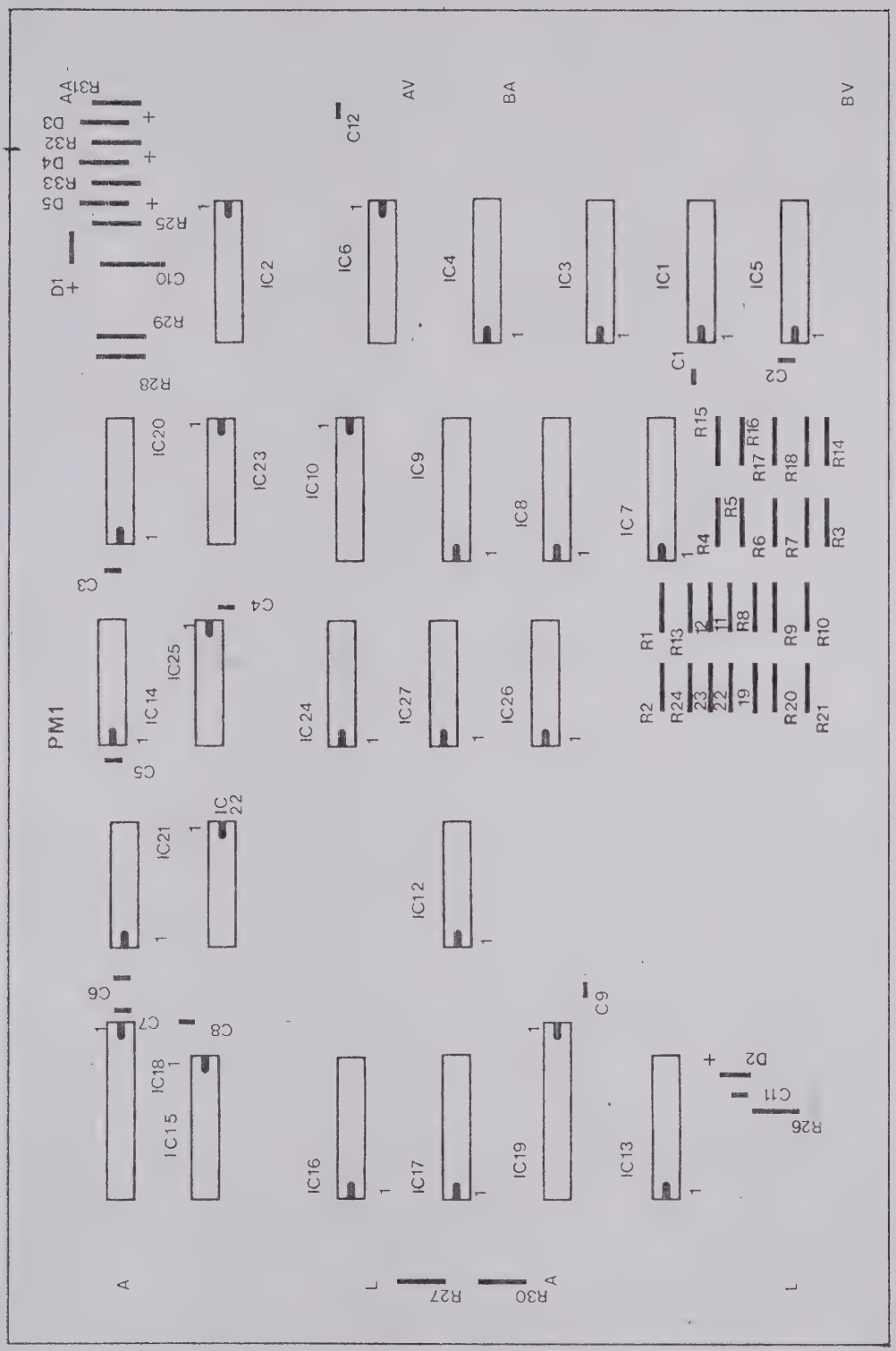

Fig. 4 Layout of R2000 interface board (4196-009)

Note. Only links marked ▬ should be fitted. Links marked ▭ (except W7 and W8) should be removed.

Fig. 5 Processor (KD11-F) card patching.

Note 1. TK 7331/1 is an MRV11-AA ROM card containing the 4 pre-programmed ROMS shown.
2. Only links marked ▬ should be fitted links marked ▭ must be removed.

Fig. 6 TK 7331/1 ROM card patching and layout.

a) TK 7315/1 b) TK 7315/2 c) TK 7315/3

Note 1. Type is identified by label at top left giving TK number
2. Only Links marked ▬ should be fitted. Links marked ▭ must be removed.

Fig. 7 TK 7315 (MSV-11B) RAM card patching.

Note 1. Insert a 0.05 μF capacitor between TP1 and TP2 when the serial line device is a teletypewriter (LT32 or LT35)).

2. Only links marked ▭ should be fitted. Links marked ▭ must be removed.

Fig. 8 TK 7316 (DLV-11) Console device interface card patching.

```
                        .TITLE  EXECUTIVE PROG FOR OE1760
                ;
                ;
                ;AUTHOR                  R.D. EAST
                ;'
                ;CREATION DATE           03-JUL-1977
                ;
                ;AMENDMENT RECORD:-      3
                ;
                ;DRAWING NO              MC4200-001 ISS.1
                ;
                ;
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```

```
EXECUTIVE PROG FOR DEI760        RT-11 MACRO VM02-12    PAGE 24

 44 73130 100473          BMI     ERR+2                   ;NO
 45 73132 010214          MOV     R2,(R4)                 ;O/P COMMAND
 46 73134 012700          MOV     #1400,R0                ;DELAY
          001400
 47 73140 077001 2$       SOB     R0,2$                   ; A BIT
 48 73142 105714 3$:      TSTB    (R4)                    ;READY?
 49 73144 100776          BMI     3$                      ;NO
 50 73146 022424          CMP     (R4)+,(R4)+             ;STEP TO CTS
 51 73150 116400          MOVB    -2(R4),R0               ;GET A CHAR
          177776
 52 73154 001746          BEQ     REENT                   ;BRANCH IF NUL
 53 73156 120027          CMPB    R0,#377                 ;OR DEL
          000377
 54 73162 001743          BEQ     REENT
 55 73164 105714          TSTB    (R4)                    ;TO CORE?
 56 73166 100425          BMI     CONT                    ;NO
 57 73170 012702          MOV     #10,R2                  ;8 BITS
          000010
 58 73174 010003          MOV     R0,R3                   ;SAVE CHAR
 59 73176 005046          CLR     -(SP)                   ;CLEAR ACC
 60 73200 106303 5$:      ASLB    R3                      ;GET A BIT
 61 73202 005516          ADC     (SP)                    ;ACCUMULATE
 62 73204 077203          SOB     R2,5$                   ;EVEN
 63 73206 006016          ROR     (SP)+                   ;PARITY?
 64 73210 103414          BCS     CONT                    ;NO
 65 73212 005714          TST     (R4)                    ;FWD?
 66 73214 100403          BMI     DUMP
 67 73216 012700 STOPRV:  MOV     #HASH,R0                ;BOT
          000243
 68 73222 000407          BR      CONT                    ;O/P TO CONT
 69 73224 005201 DUMP:    INC     R1
 70 73226 020105          CMP     R1,R5                   ;TOO BIG?
 71 73230 001412          BEQ     ERR
 72 73232 110011          MOVB    R0,(R1) ;SAVE IT
 73 73234 120027          CMPB    R0,#ASTRIX              ;IS IT *
          000252
 74 73240 001314          BNE     REENT                   ;NO
 75 73242 110064 CONT:    MOVB    R0,3(R4)                ;YES-O/P IT
          000003
 76 73246 012703          MOV     #30,R3                  ; WAIT
          000030
 77 73252 077301 6$:      SOB     R3,6$                   ;A BIT
 78 73254 000706          BR      REENT
 79                       .DSABL  LSB
 80 73256 012764 ERR:     MOV     #4,-4(R4)               ;LIGHT THE LIGHT
          000004
          177774
 81 73264 112741          MOVB    #ASTRIX,-(R1)
          000252
 82 73270 112764          MOVB    #ASTRIX,3(R4)           ; AND STOP THE TAPE
          000252
          000003
 83 73276 000672          BR      BUTTON                  ; RESET THE POINTER
 84 73300 022424 ERR2:    CMP     (R4)+,(R4)+             ;POINT TO CTS
 85 73302 005714          TST     (R4)                    ; FWD?
 86 73304 100344          BPL     STOPRV                  ; YES
 87 73306 012700          MOV     #ASTRIX,R0              ; STOP THE TAPE
```

```
EXECUTIVE PROG FOR OE1760          RT-11 MACRO VM02-12     PAGE 2+


                000252
  88 73312 000753          BR      CONT
  89 73314 005301 UNDUMP:  DEC     R1
  90 73316 005714          TST     (R4)                ;FWD?
  91 73320 100001          BPL     1$
  92 73322 122121          CMPB    (R1)+,(R1)+
  93 73324 020127 1$:      CMP     R1,#300             ;TOO SMALL?
                000300
  94 73330 002002          BGE     2$
  95 73332 005201          INC     R1
  96 73334 000730          BR      STOPRV              ;YES
  97 73336 111100 2$:      MOVB    (R1),R0
  98 73340 000740          BR      CONT
```

```
EXECUTIVE PROG FOR DE1760        RT-11 MACRO VM02-12    PAGE 3


 1 173342 111100 TTY1:    MOVB    (R1),R0
 2 173344 105737 TTY0:TSTB        @#177564          ;ECHO
          177564
 3 173350 100375          BPL     TTY0
 4 173352 110037          MOVB    R0,@#177566       ;IT
          177566
 5 173356 042700          BIC     #200,R0           ;STRIP THE PARITY
          000200
 6 173362 010046          MOV     R0,-(SP)          ;PUT
 7 173364 005046          CLR     -(SP)             ;ON
 8 173366 012703          MOV     #10,R3            ;THE
          000010
 9 173372 106300 2$:      ASLB    R0        ;PARITY
10 73374 005516           ADC     (SP)
11 73376 077303           SOB     R3,2$             ;REQUIRED
12 73400 106026           RORB    (SP)+             ;AND
13 73402 106000           RORB    R0                ;THEN
14 73404 152600           BISB    (SP)+,R0
15 73406 000207           RTS     PC
16
17
18
19
20
21 73410 004767 NEXTER:  JSR     PC,TTY0
          177730
22 73414 000000          HALT:   HALT
23 73416 000625          BR      REENT
24
25
26
27
28
29
30 73420 005201 GETCR:   INC     R1
31 73422 124127 2$:      CMPB    -(R1),#HASH
          000243
32 73426 001403          BEQ     1$
33 73430 121127          CMPB    (R1),#CR
          000215
34 73434 001372          BNE     2$
35 73436 000207 1$:      RTS     PC
36
37
38
39
40
41
42 73440 112100 OUTEXT:  MOVB    (R1)+,R0
43 73442 004767          JSR     PC,TTY0
          177676
44 73446 004767          JSR     PC,TTY1
          177670
45 73452 122127 1$:      CMPB    (R1)+,#ASTRIX
          000252
46 73456 001404          BEQ     2$
47 73460 004767          JSR     PC,TTY1
```

```
EXECUTIVE PROG FOR OE1760          RT-11 MACRO VM02-12     PAGE 3+


                177656
 48 73464 121104          CMPB    (R1),R4
 49 73466 001371          BNE     1$
 50 73470 000207 2$:      RTS     PC
 51
 52
 53
 54
 55
 56
 57
 58 73472 005000 OUTNUL:  CLR     R0
 59 73474 012704          MOV     #300,R4
                000300
 60 73500 004767 1$:      JSR     PC,TTY0
                177640
 61 73504 077403          SOB     R4,1$
 62 73506 000207          RTS     PC
 63
 64
 65
 66
 67
 68
 69 73510 005201 NEXT:    INC     R1
 70 73512 121127          CMPB    (R1),#ASTRIX
                000252
 71 73516 001734          BEQ     NEXTER
 72 73520 121127          CMPB    (R1),#CR
                000215
 73 73524 001371          BNE     NEXT
 74 73526 004767 LIST:    JSR     PC,GETCR
                177666
 75 73532 010102          MOV     R1,R2
 76 73534 012704          MOV     #LF,R4
                000012
 77 73540 004767          JSR     PC,OUTEXT
                177674
 78 73544 010201          MOV     R2,R1
 79 73546 000722          BR      HALT
 80
 81
 82
 83
 84
 85
 86
 87 73550 004767 SAVE:    JSR     PC,GETCR
                177644
 88 73554 004767          JSR     PC,OUTNUL
                177712
 89 73560 005204          INC     R4
 90 73562 004767 1$:      JSR     PC,OUTEXT
                177652
 91 73566 004767          JSR     PC,OUTNUL
                177700
 92 73572 000710          BR      HALT
```

```
EXECUTIVE PROG FOR OE1760        RT-11 MACRO VM02-12    PAGE 4


 1 173574 004767 EDIT:   JSR     PC,GETCR
          177620
 2 173600 005037         CLR     @#PRS
          160770
 3 173604 122127         CMPB    (R1)+,#CR
          000215
 4 173610 001001         BNE     1$
 5 173612 005201         INC     R1
 6 173614 010146 1$:     MOV     R1,-(SP)
 7 173616 000403         BR      6$
 8 173620 121127 2$:     CMPB    (R1),#ASTRIX
          000252
 9 173624 001414         BEQ     3$
10 73626 122127 6$:     CMPB    (R1)+,#CR
          000215
11 73632 001372         BNE     2$
12 73634 005201         INC     R1
13 73636 010146         MOV     R1,-(SP)
14 73640 122127 5$:     CMPB    (R1)+,#ASTRIX
          000252
15 73644 001375         BNE     5$
16 73646 114145 4$:     MOVB    -(R1),-(R5)
17 73650 020116         CMP     R1,(SP)
18 73652 001375         BNE     4$
19 73654 012601         MOV     (SP)+,R1
20 73656 011601 3$:     MOV     (SP),R1
21 73660 105737 TTY:    TSTB    @#177560
          177560
22 73664 100375         BPL     TTY
23 73666 113700         MOVB    @#177562,R0
          177562
24 73672 120027         CMPB    R0,#33
          000033
25 73676 001406         BEQ     RESTAK
26 73700 020105         CMP     R1,R5
27 73702 103013         BHIS    ERR1
28 73704 004767         JSR     PC,TTY0
          177434
29 73710 110021         MOVB    R0,(R1)+
30 73712 000762         BR      TTY
31 73714 112511 RESTAK: MOVB    (R5)+,(R1)
32 73716 122127         CMPB    (R1)+,#ASTRIX
          000252
33 73722 001374         BNE     RESTAK
34 73724 012601         MOV     (SP)+,R1
35 73726 005300         DEC     R0
36 73730 000631         BR      HALT
37 73732 012737 ERR1:   MOV     #4,@#PRS
          000004
          160770
38 73740 000765         BR      RESTAK
39
40
41
42
43
44
```

```
EXECUTIVE PROG FOR 0E1760        RT-11 MACRO VM02-12    PAGE 4+


 45 73742 012704 MANIP: MOV      #CTS,R4
          160774
 46 73746 105737         TSTB    @#177560
          177560
 47 73752 100373         BPL     MANIP
 48 73754 113700         MOVB    @#177562,R0
          177562
 49 73760 004767         JSR     PC,TTY0
          177360
 50 73764 110064         MOVB    R0,3(R4)
          000003
 51 73770 120027         CMPB    R0,#LF
          000012
 52 73774 001362         BNE     MANIP
 53 73776 000606         BR      HALT
 54       000001'        .END
```

```
EXECUTIVE PROG FOR 0E1760        RT-11 MACRO VM02-12    PAGE 4+
SYMBOL TABLE

ASTRIX= 000252          BUTTON  173064          CONT    173242
CR    = 000215          CTB   = 160776          CTS   = 160774
DUMP    173224          EDIT    173574          ERR     173256
ERR1    173732          ERR2    173300          GETCR   173420
HALT    173414          HASH  = 000243          LF    = 000012
LIST    173526          MANIP   173742          NEXT    173510
NEXTER  173410          OUTEXT  173440          OUTNUL  173472
PC    =%000007          PRB   = 160772          PRS   = 160770
REENT   173072          RESRT   173000          RESTAK  173714
R0    =%000000          R1    =%000001          R2    =%000002
R3    =%000003          R4    =%000004          R5    =%000005
SAVE    173550          SP    =%000006          STOPRV  173216
TRAP00  173006          TTY     173660          TTY0    173344
TTY1    173342          UNDUMP  173314
. ABS.  174000    000
        000000    001
ERRORS DETECTED:  0
FREE CORE:  13977.  WORDS

.LP:<DX1:EXEC.3A
```

Chapter 6

REPLACEABLE PARTS

CONTENTS

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2	Component values	1
4	Ordering	2
5	Parts lists	3

ABBREVIATIONS

1. The components are listed in alpha-numerical order and use the following abbreviations and symbols :

C : capacitor
Cer : ceramic
D : diode
Elec : electrolytic
F : fan
FS : fuse
IC : integrated circuit
LP : lamp
Met : metal
PBS : push-button switch
Plas : plastic
R : resistor
ROM : read only memory
Tant : tantalum
Var : variable
W : watts at 70°C
WW : wirewound

COMPONENT VALUES

2. One or more of the components fitted in this instrument may differ from those listed in this chapter for any of the following reasons :

(a) Components indicated by a † have their values selected during test to achieve particular performance limits.

(b) Owing to supply difficulties, components of different value or type may be substituted provided the overall performance of the instrument is maintained.

(c) As part of a policy of continuous development, components may be changed in value or type to obtain detail improvements in performance.

3. When there is a difference between the component fitted and the one listed, always use as a replacement the same type and value as found in the instrument.

ORDERING

4. When ordering replacements, address the order to our Service Division or nearest agent and specify the following for each component required :

(1) Type* and serial number of instrument

(2) Complete circuit reference

(3) Description

(4) MI code number

* As given on the serial number label at the rear of the instrument; if this is superseded by a model number label, quote the model number instead of the type number.

PARTS LIST

5. Main Assembly

Circuit reference	Description	MI code
C1	Elec 33000µF 40V (Mullard 106-17333)	
C2	Plas 0.33µF ±10% 160V	26511-368B
C3	Tant 2.2µF ±20% 50V (ITT : TAA 2.2M50B)	
C4	Tant 22µF ±20% 50V (ITT : 22M50 or 22K50)	
C6	Elec 100µF ±20% 20V	26486-609Z
D1	PM 742	
D4	1N5907	28383-994S
D5	ICT 15	28383-996D
D6	ICT 15	28383-996D
F1	Etri type 126LF 01 115V Code 13	
F2	Etri type 126LF 01 115V Code 13	
FS1	1A (230V working) Slow blow	23411-058C
	2A (115V working) Slow blow	23411-060M
	Fuse holder	23416-191C
FS2	10A	23411-265C
	Fuseholder	23416-271E
FS3	2A Quick action	23411-007N
	Fuseholder	23416-191C
IC1	SMR 56-7 Switching Mode regulator (FR Electronics)	
IC2	LAS 1412	28461-715T
LP1-4	See PBS 1-4	
LP5	STORE FULL (RAFI:1.65111.001/13)	
LP6	HALTED (RAFI:1.65111.001/13)	
	Bulbs for LP1-6	23735-456E
PBS1	SUPPLY (RAFI:1.15108.102/13)	
PBS2	LOAD (RAFI:1.15108.001/10)	
PBS3	OUTPUT (RAFI:1.15108.001/14	
PBS4	BYPASS (RAFI:1.15108.001/15	
R1	WW 330 Ω ±5% 1.5W	25123-063X

Circuit reference	Description	MI code
Miscellaneous		
	Transformer assembly	4191-010
	Edge connector assembly (2)	
	Back plane assembly (DEC H9270)	
	Central Processor (DEC KD 11F)	28469-377F
	ROM card (DEC MRV 11A)	
	Set of ROMS	44531-001U
6.	Power fail board	
	Complete board	44828-064Z
C1	Elec 1000μF +100%-20% 10V	26415-824S
C2	Elec 4.7μF +100%-20% 63V	26415-801M
C3	Cer .1μF +50%-25% 30V	26383-031S
C4 to C6	Cer .01μF +50% -25% 25V	26383-006C
C7	Elec 4.7μF +100%-20% 63V	26415-801M
C8	Elec 1μF ±20% 35V	26486-513U
D1	1N4148	28336-676J
D2	BZY 88 C6V2	28371-483P
D3	1N4004	28357-028K
D4	BZY88 C6V2	28371-483P
D5 to D8	1N4148	28336-676J
D9	1N4004	28357-028K
D10	1N4004	28357-028K
IC1	CA3046	28461-901A
IC2	CA3046	28461-901A
IC3	SN74123N	28468-302D
IC4	SN7414N	28469-204Y
R1	Met film 820 Ω ±2% 0.25W	24773-271B
R2	Met film 6.2kΩ ±2% 0.25W	24773-292W
R3	Met film 3.9kΩ±2% 0.25W	24773-287V
R4	Met film 6.2kΩ ±2% 0.25W	24773-292W
R5	Met film 5.6kΩ ±2% 0.25W	24773-291S
R6	Var. 2kΩ ±10% 0.3W	25748-505T
R7	Met film 47kΩ ±2% 0.25W	24773-313H
R8	Met film 47kΩ ±2% 0.25W	24773-313H
R9	Met film 100kΩ ±2% 0.25W	24773-321L
R10	Met film 2kΩ ±2% 0.25W	24773-280U
R11	Met film 51 Ω ±2% 0.25W	24773-242Z

Circuit reference	Description	MI code
	Power fail board (continued)	
R12	Met film 51 Ω ±2% 0.25W	24773-242Z
R13	Met film 6.2kΩ ±2% 0.25W	24773-292W
R14	Var 2kΩ ±10% 0.3W	25748-505T
R15	Met film 82Ω ±2% 0.25W	24773-247N
R16	Met film 47kΩ ±2% 0.25W	24773-313H
R17	Met film 22kΩ ±2% 0.25W	24773-305R
R18	Met film 2kΩ ±2% 0.25W	24773-280U
R19	Met film 51kΩ ±2% 0.25W	24773-314E
R20	Met film 100Ω ±2% 0.25W	24773-249J
R21 †	Met film 820Ω ±2% 0.25W	24773-271B
TR1	BFY 51	28455-827T
TR2	BC 238	28452-781A
7.	R2000 Interface board	
C1 to C9	Cer .01μF +50%-25% 25V	26383-055L
C10	Plas 1 800pF ±2% 160V	26516-543H
C11	Cer .01μF +50%-25% 25V	26383-055L
C12	Cer .01μF +50%-25% 25V	26383-055L
D1	1N4148	28336-676J
D2	1N4148	28336-676J
D3 to D5	AAZ 17	28322-157G
IC1	N8T38B	28469-175V
IC2	N8T37B	28469-174G
IC3 to IC6	N8T38B	28469-175V
IC7	DM8136	
IC8	DM8136	
IC9	SN 74LS 175N	28462-614E
IC10	SN 74155N	28465-008C
IC11	SN 7408N	28466-003Z
IC12	SN 7402N	28466-204B
IC13	SN 74123N	28468-302D
IC14	SN 74121N	28468-402S
IC15	SN 74157N	28465-012R
IC16	SN 74157N	28465-012R
IC17	SN 74LS153N	
IC18	SN74273N	28462-613H
IC19	SN 74273N	28462-613H

Circuit reference	Description	MI code
	R2000 Interface board (continued)	
IC20	SN 7474N	28462-002N
IC21	SN 7411N	28466-002A
IC22	SN 7410N	28466-323F
IC23	SN 7406	28469-158A
IC24	SN 7400N	28466-321L
IC25	SN 7404N	28469-156B
IC26	SN 7410N	28466-323F
R1	Met film 330 Ω ±2% $\frac{1}{4}$W	24773-261D
R2	Met film 680 Ω ±2% $\frac{1}{4}$W	24773-269K
R3 to R13	Met film 330 Ω ±2% $\frac{1}{4}$W	24773-261D
R14 to R24	Met film 680 Ω ±2% $\frac{1}{4}$W	24773-269K
R25	Met film 12kΩ ±2% $\frac{1}{4}$W	24773-299R
R26	Met film 24kΩ ±2% $\frac{1}{4}$W	24773-306B
R27 to R30	Met film 10kΩ ±2% $\frac{1}{4}$W	24773-297M
R31 to R33	Met film 1kΩ ±2% $\frac{1}{4}$W	24773-273A

Chapter 7

SERVICING DIAGRAMS

1. This chapter contains the following drawings :

SY57298-900B	Power supply and wiring diagram
SZ44828-064Z	Power fail circuit
SZ44827-871H	R2000 interface circuit

Note ...

Details of DEC equipment will be found in the drawings and manuals supplied by DEC.

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NOTES

1 LEADS FROM C1 TO BE AS SHORT AS POSSIBLE
2 WIRE SIZES
a 7/0·0076
b 1"EM 36
c 14/0·0076
d 23/0·0076
e 40/0·0076
f 24/0·0076
g 22 SWG TINNED Cu WIRE

NOTE FANS F1 & F2 ON EARLY MODELS WERE 240V WIRED IN PARALLEL

SUPPLY
SUPPLY
FS1 2A 115V 1A 230V
PBS1
F1
F2
125 V
125 V
0 V
SCR A
SAFETY EARTH
H9270 TERMINALS
12V 5V BPOK BDCOK
C44828-064Z
D1 PM 7A2
R1 330
C1 33000 µF
C3 2·2µF
C4 22µF
IC - VO1 VO2 GO1 GO2 VI1 VI2 GI1 GI2
SMR 56-7
D4 IN 5907
FS2 10A
5V
0V
SK 2A & SK 2B (H9270)
C2 ·33µF
D5 ICT 15
D6 ICT 15
IC 2 LAS 1412
C6 ·33µF
FS3 2A
12 V
P1
TP 2
TP 1
0 V
2 V
PBS 2
PBS 3
PBS4
AF 1
AE 1
AH 1
LOAD
OUTPUT
BY-PASS
STORE FULL
HALTED
P2
P3
P5
LP 6
BF 1
BE 1

PIN LOCATION ON IC 2

ISS	CHANGES	FIRST USED
		TK 7298
1		
2	D2 & D3 DELETED C6, R2 & R3 ADDED FAU NOTE ADD. 6-12-76 K.R.	
3	TP2 & TP1 ADD IC2: PIN 1 WAS 3, PIN 2 WAS 4, PIN 3 WAS 1, PIN 4 WAS 2. NOTE & WIRE SIZE ADDED 15-3-77 K.R.	
5	SK 2A & SK 2B WAS SKA, C44828-064Z ADDED DR 22-9-77	
A	AS PER 5 ON ORIG	

CHECKED	DIMENSIONS IN INCHES M.M.	MATERIAL	FINISH	TOLERANCES UNLESS OTHERWISE STATED	TITLE PROGRAM STORE TK 7298 POWER SUPPLY AND WIRING DIAGRAM	DRAWING NUMBER SH.1 OF 1 SHTS
TRACED	SCALE	M1 LTD SPEC	M1 LTD SPEC	0.0 · 0.5 mm (· ·020) 0.00 · 0.2 mm (· ·008) METRIC TOLERANCES APPLY INCH EQUIVALENTS IN BRKTS	MARCONI INSTRUMENTS LIMITED ST. ALBANS ENGLAND	SY/S/7/2/9/8-9/0/0/B
DRAWN 6/10/76 K REED	APPROVED				PRELIM. DWG No	THIRD ANGLE PROJECTION ISO A 2

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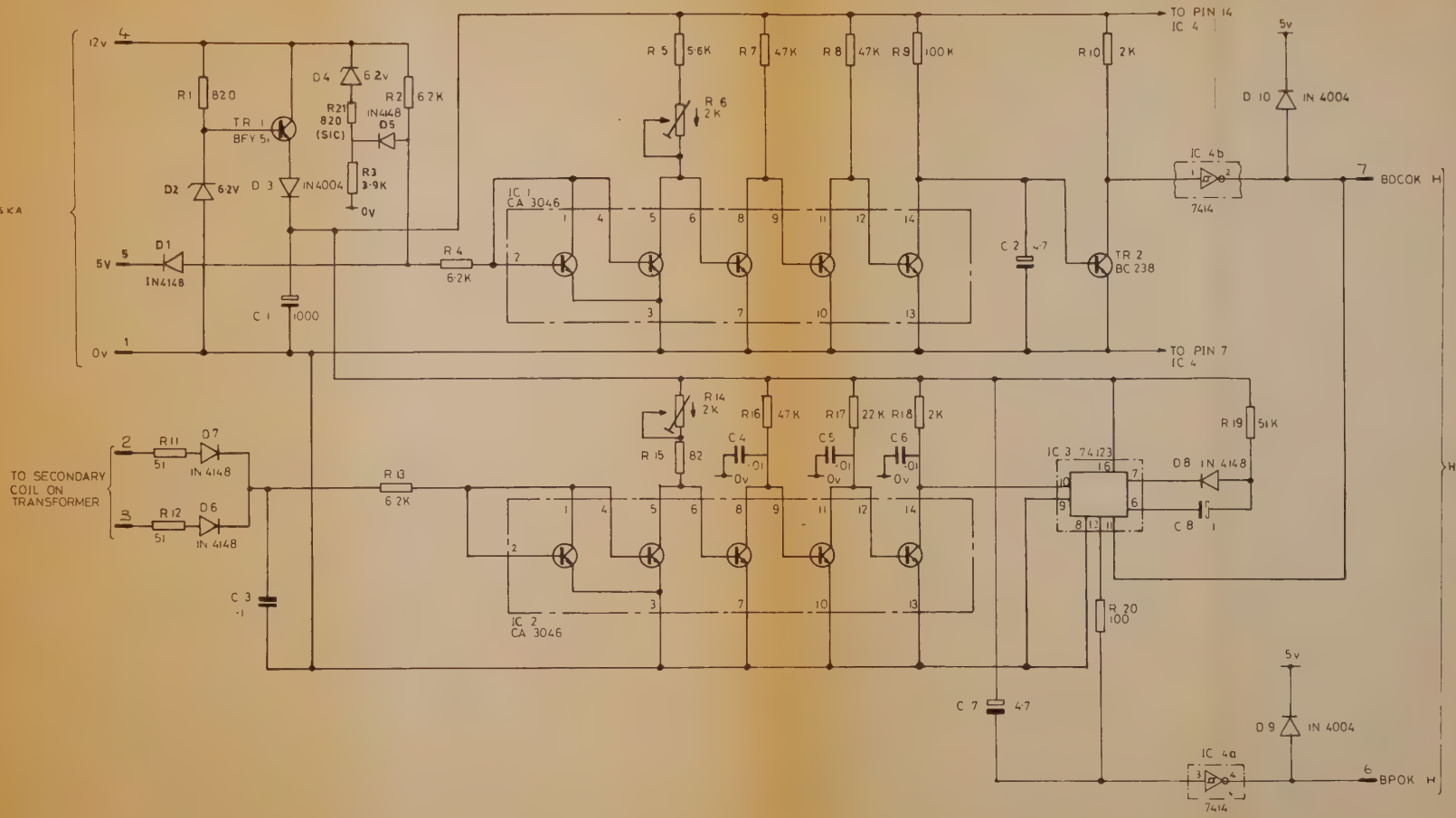
NOTES

FIRST USED
TK 7298

ISS	CHANGES
1	
2	R16 & R14 WERE 2·2K 14/4/77 K.R
3	H9270 WAS SKA, ADD. PIN NUMBER 1 TO 7 DJHR 22-9-77
A	ASPER 4 ON ORIG.
B	ASPER 5 & 6 ON ORIG.
C	



CHECKED	DIMENSIONS IN INCHES M.M.	MATERIAL	FINISH	TOLERANCES UNLESS OTHERWISE STATED	TITLE	DRAWING NUMBER SH.1 OF 1 SHTS
/ /		M1 LTD SPEC	M1 LTD SPEC	0.0 ± 0.5 mm (± ·020)	POWER FAIL CIRCUIT	SZ 4828-0642
TRACED / /	SCALE			0.00 ± 0.2 mm (± ·008)	MARCONI INSTRUMENTS LIMITED	PRELIM DWG No.
DRAWN 4/3/77 K REED	APPROVED 15/3/77 R D EVANS			METRIC TOLERANCES APPLY INCH EQUIVALENTS IN BRKTS	ST. ALBANS ENGLAND	THIRD ANGLE PROJECTION ISO A 2

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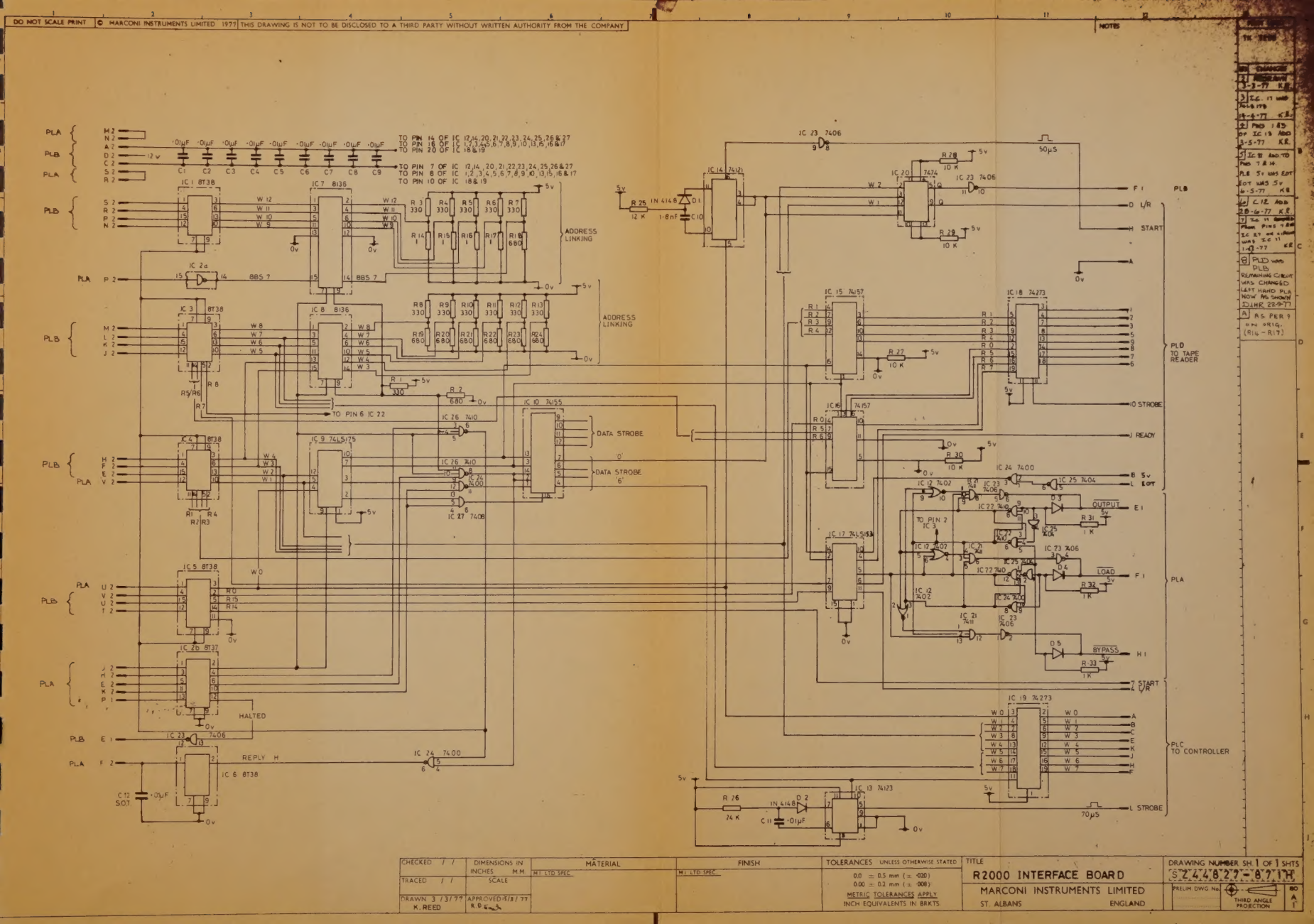

CHECKED / /	DIMENSIONS IN INCHES M.M.	MATERIAL M.I. LTD SPEC	FINISH M.I. LTD SPEC.	TOLERANCES UNLESS OTHERWISE STATED 0.0 ± 0.5 mm (± .020) 0.00 ± 0.2 mm (± .008) METRIC TOLERANCES APPLY INCH EQUIVALENTS IN BRKTS	TITLE R2000 INTERFACE BOARD MARCONI INSTRUMENTS LIMITED ST. ALBANS ENGLAND	DRAWING NUMBER SH. 1 OF 1 SHTS ST2448827-8717H
TRACED / /	SCALE				PRELIM DWG No.	THIRD ANGLE PROJECTION
DRAWN 3/3/77 K. REED	APPROVED 15/3/77 R D Gash					80 A 1

No.	CHANGES
1	3-3-77 KR
2	IC 17 was 74LS 175 19-4-77 KR
3	PRO 183 OP IC 13 ADD 3-5-77 KR
4	IC 21 ADD TO PRO 7 & 14. PLB 5v was EOT EOT was 5v 6-5-77 KR
5	C 12 ADD 28-6-77 KR
6	IC 11 Pins 1 & 2 IC 27 are either was IC 11 1-9-77 KR
7	PLD was PLB. REMARK CIRCUIT WAS CHANGED LEFT HAND PLA NOW AS SHOWN DJHR 22-9-77
A	AS PER 9 ON ORIG. (R14 - R17)

MP MASTER
MA23650